

GSMA™

The Mobile Economy North America 2023



GSMA

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

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Executive summary

5G enters its next phase

The US and Canada are among the global leaders in terms of 5G adoption, reflecting the ambitious rollout plans of operators and strong demand from consumers for new services. However, following extensive 5G network buildout over the last few years, capex levels will begin to trend downwards as operators turn their attention to generating a return on investment. The focus over the next few years will be on improving 5G coverage in less densely populated areas while also ramping up investment to support the growing momentum behind use cases enabled by 5G standalone (SA) and 5G-Advanced.

5G connectivity is already proving to be a powerful driver of GDP growth, with 5G's contribution to GDP in North America expected to surpass \$200 billion in 2030 (16% of the overall annual economic impact of mobile in the region). Beyond its contribution to GDP, the mobile ecosystem also supports 2.1 million jobs (directly and indirectly) and makes a substantial contribution to the funding of the public sector, with \$130 billion raised through taxation in 2022. This economic contribution underlines the importance of stakeholders taking the right steps to sustain the impact of mobile services on the digital economy, with spectrum availability a key driver of affordable 5G for all.

5G's contribution to GDP in North America is expected to surpass \$200 billion in 2030



Key trends shaping the mobile ecosystem

The 5G monetisation imperative grows

As 5G adoption grows, the monetisation imperative will escalate. GSMA Intelligence research shows that the mobile ARPU trend in the US and Canada improved in the 12 months after launching 5G. The technology is also having a positive impact on revenue growth for North American operators beyond mobile services, as highlighted by fixed wireless access (FWA) momentum in the region. Looking forward, the enterprise sector is expected to be the main growth driver for operators. 5G SA brings a host of new capabilities that will be crucial to monetising 5G investments, including improved support for network slicing. There are also synergies between 5G SA and private wireless networks, opening up new opportunities for mobile operators.

Generative AI takes centre stage

Mobile operators have utilised AI for a while now to varying degrees. However, the emergence of generative AI has pushed the envelope on AI capabilities and thrust AI technology into boardroom conversations globally. With generative AI tools, operators can attempt to automate more complex customer service functions that require a better understanding of context, improved ability to follow a conversation and advanced synthesis of information. The technology can also be used to improve network operations and deliver personalised service plans. However, ethical concerns around the technology still need to be addressed. AI regulation will therefore continue to move up the policy agenda as governments develop frameworks for regulating the use of new AI tools.

eSIM momentum builds

The last few years have been crucial for eSIM development and commercialisation, highlighted by Apple's launch of eSIM-only smartphones in September 2022 in the US and Canada. There has since been an acceleration in operator eSIM deployments and commercial launches. However, eSIM awareness among consumers remains limited. As the main contact points with end users, operators and smartphone manufacturers have a key role to play in accelerating consumer awareness and

adoption. Additionally, eSIM technology has long been seen as a major enabler and accelerator of IoT deployments across multiple sectors. This has led North American operators to partner with a range of players across the IoT ecosystem to accelerate eSIM adoption in the region.

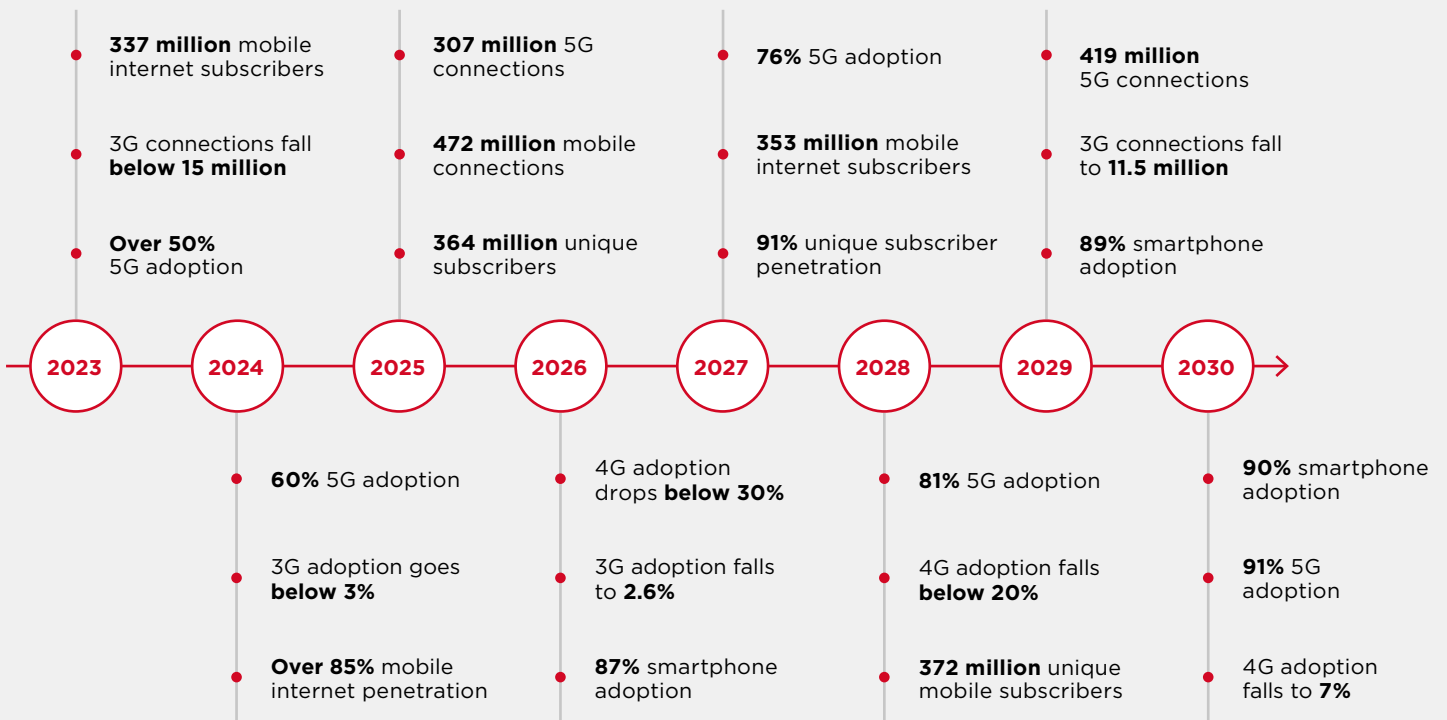
The shift towards circularity gains traction

The concept of circularity has risen up the agenda for policymakers and industry players in light of growing concerns around the generation of e-waste and unsustainable levels of consumption of natural resources. Although the technical lifespan of a mobile device is now between four and seven years, the average use period of mobile devices is only around three years. Governments and industry players have a role to play in incentivising consumers, such as by building new channels for suppliers to collect, refurbish and resell devices and implementing awareness campaigns on sustainability. Operators and other ecosystem players in North America are already taking a lead in this regard, with a number of initiatives to drive circularity in mobile phones and other digital devices.

Growing opportunities for operators as fintech demand surges

GSMA Intelligence survey data shows that between 2020 and 2022, the share of 4G/5G smartphone users in the US using their devices for financial services on a daily basis grew by four percentage points on average across mobile banking, online shopping, paying bills and contactless payments. This reflects growing momentum behind digital financial services as the competition heats up in the fintech market. For example, Apple recently announced the launch of a buy now, pay later (BNPL) service, which should contribute to a boost in e-commerce transactions. It has also launched a high-yield savings account through a partnership with Goldman Sachs, which reportedly brought in \$990 million in deposits over its first four days. By the end of the first week, around 240,000 accounts had reportedly been opened.

Key mobile industry milestones to 2030



Policies for growth and innovation

The success of 5G rollouts depends on operators' 5G spectrum holdings across low, mid- and high bands to deliver both speed and geographical coverage. Additional spectrum can boost the provision of cost-efficient investment and enhance network quality in North America, which can help 5G become a central pillar of the region's economic development strategies. The International Telecommunication Union's (ITU) World Radiocommunication Conference 2023 (WRC-23) will take place from 20 November to 15 December 2023 in Dubai, offering an opportunity to build a spectrum roadmap going into 2030.

Access to more low-band spectrum (470-694 MHz) is on the WRC agenda for countries in Europe, the Middle East and Africa, which can widen harmonisation of existing low bands in North America. The future of mid-band spectrum is also on the agenda. There is an opportunity to expand the harmonisation of 3.3-3.8 GHz, while 4.80-4.99 GHz is also being considered as a way of providing additional mid-band capacity. Furthermore, many parts of the world will use 6 GHz for 5G following on from WRC-23.

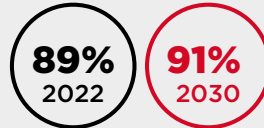
The Mobile Economy North America



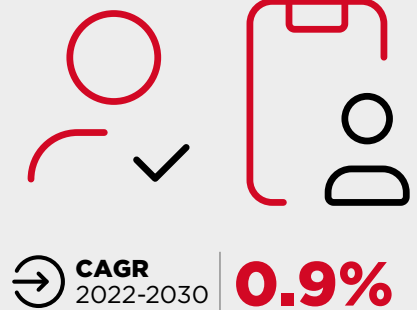
Unique mobile subscribers



352m
377m



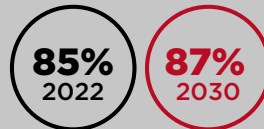
Penetration rate
Percentage of population



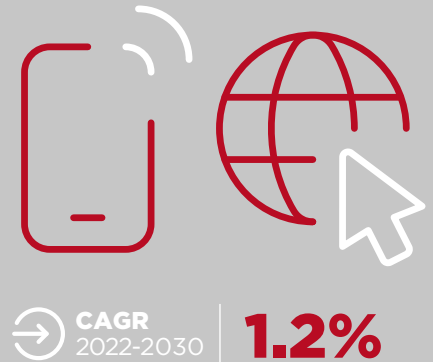
Mobile internet users



328m
362m



Penetration rate
Percentage of population



SIM connections (excluding licensed cellular IoT)



445m
481m



Penetration rate
Percentage of population



CAGR 2022-2030
1%



4G Percentage of connections (excluding licensed cellular IoT)



56%
7%



5G Percentage of connections (excluding licensed cellular IoT)



39%
91%



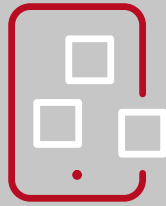


Smartphones

Percentage of connections
(excluding licensed cellular IoT)

2022

84%



2030

90%



Licensed cellular IoT connections



2022

216m

2030

539m



Operator revenues and investment

2022

\$309bn

Total revenues

2030

\$345bn

Operator capex

\$390bn

2023 — 2030



Mobile industry contribution to GDP

2022

\$1.2tn

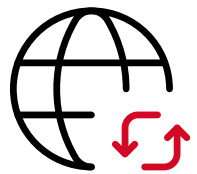
4.3% of GDP

2030

\$1.3tn



Public funding



2022

\$130bn

Mobile ecosystem contribution to public funding (before regulatory and spectrum fees)



Employment

1 million jobs



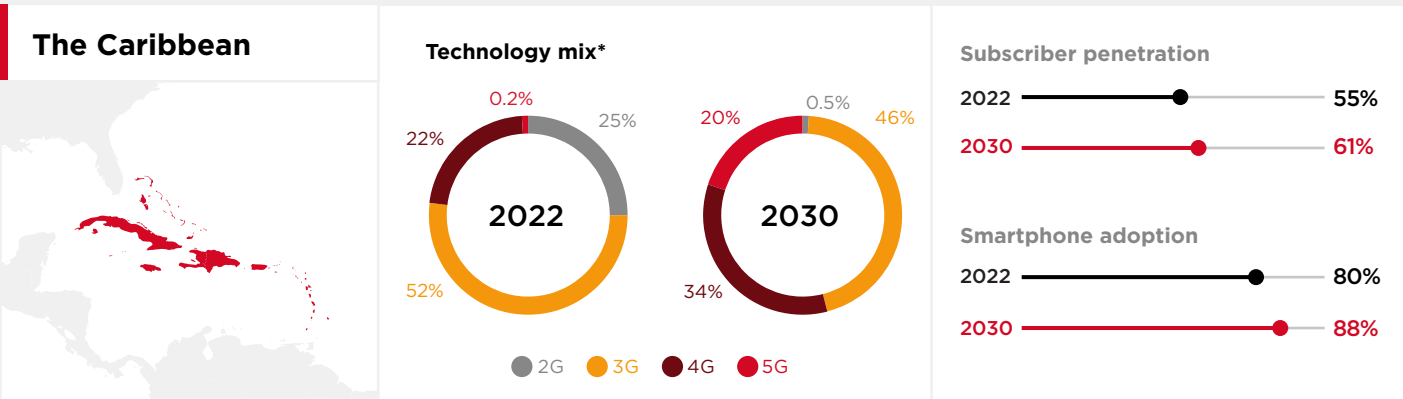
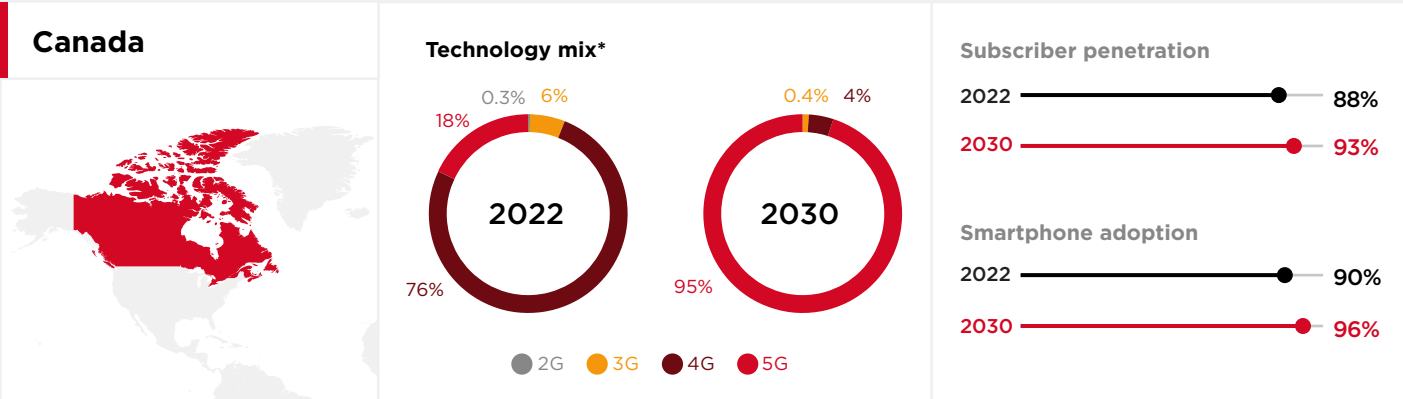
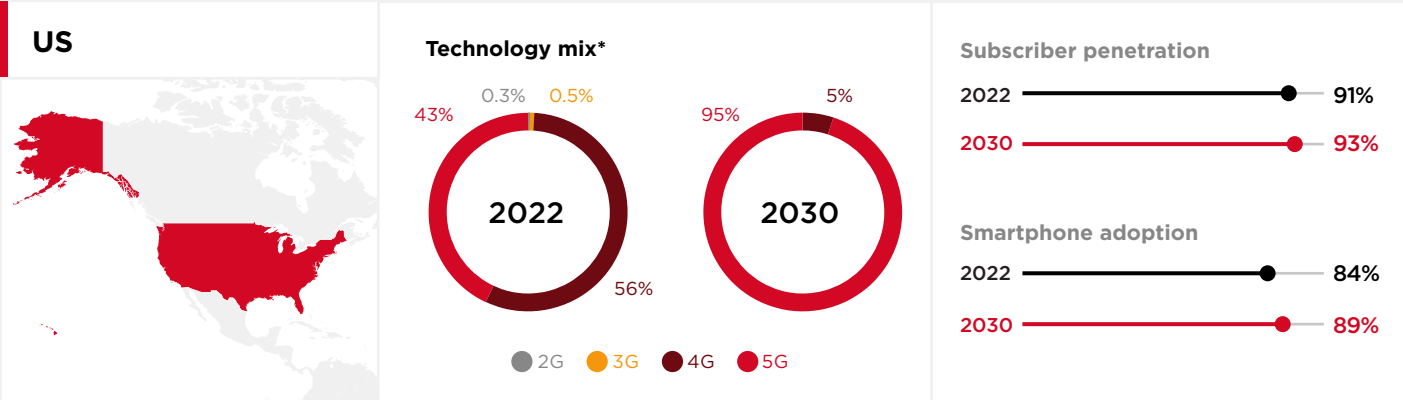
Directly supported by the mobile ecosystem in 2022



1.1 million jobs



supported indirectly



* Percentage of total connections

Defining North America

We define North America in this report as the US, Canada, Greenland and the Caribbean (for Mexico, please see The Mobile Economy Latin America).

The Caribbean includes the following countries or territories: Anguilla; Antigua and Barbuda; Aruba; Bahamas; Barbados; Bermuda; Cayman Islands; Curacao; Dominica; Grenada; Guadeloupe; Haiti; Jamaica; Martinique; Montserrat; Puerto Rico; Saint Kitts and Nevis; Saint Lucia; Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Trinidad and Tobago; Turks and Caicos Islands; British Virgin Islands; and the US Virgin Islands.



01

The mobile industry in numbers



Unique mobile subscribers to grow by nearly 25 million in North America by 2030

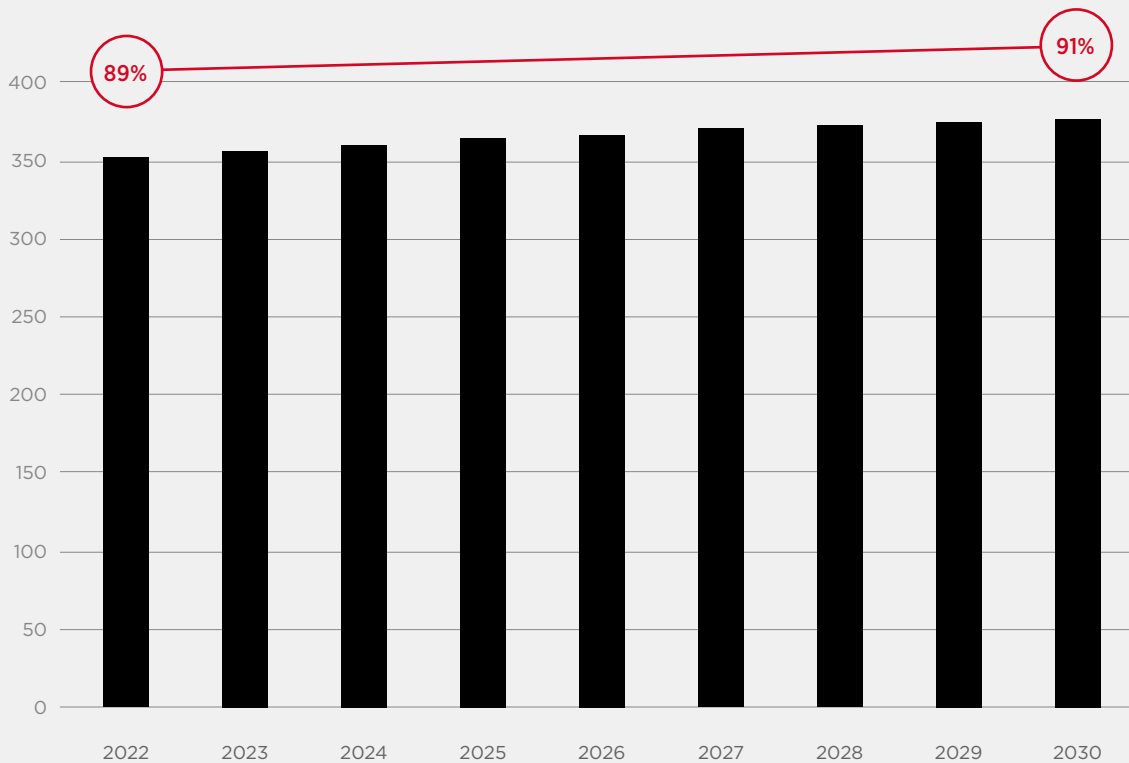
There has been a steady growth of unique mobile subscribers in North America, which will reach a total of 377 million by 2030. The US will account for more than 85% of total mobile subscribers in the region by the same year.

Mobile penetration in North America will reach 91% by 2030, which will be much higher than the global average of 73%. The penetration rate will be highest in the US and Canada at 93% for both countries.

Figure 1

North America: mobile subscribers and penetration

Million, percentage of population



Source: GSMA Intelligence



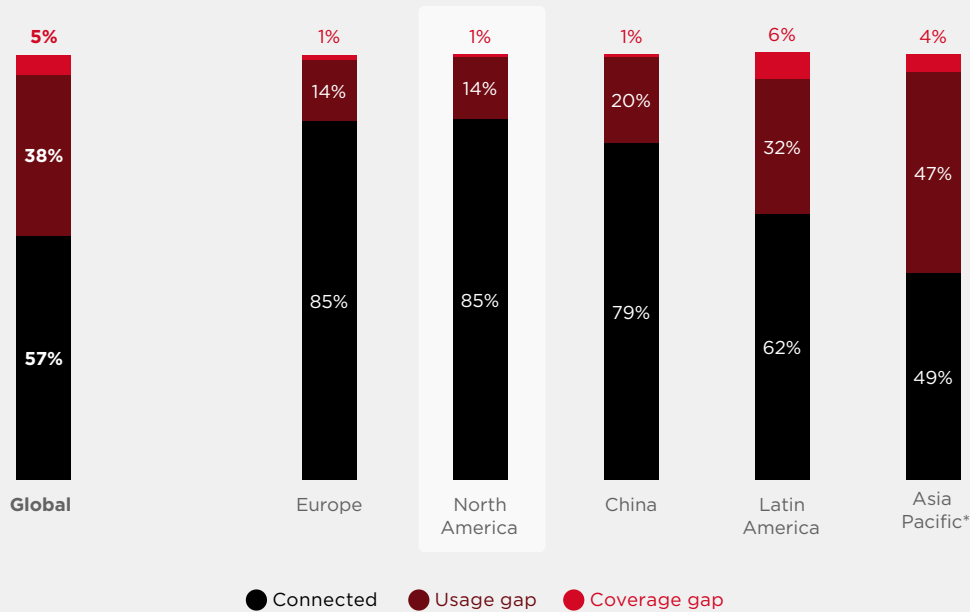
Mobile internet adoption reached 85% in North America in 2022

With more than 328 million people connected to the mobile internet in North America in 2022, the mobile internet usage gap has narrowed to 14%.

The mobile internet landscape in the region varies significantly, with penetration levels of more than 80% in the US and Canada, compared to 39% in the Caribbean, which had 8.4 million mobile internet subscribers in 2022.

Figure 2
Mobile internet penetration by region, 2022

Percentage of population



* Excludes China
 Source: GSMA Intelligence

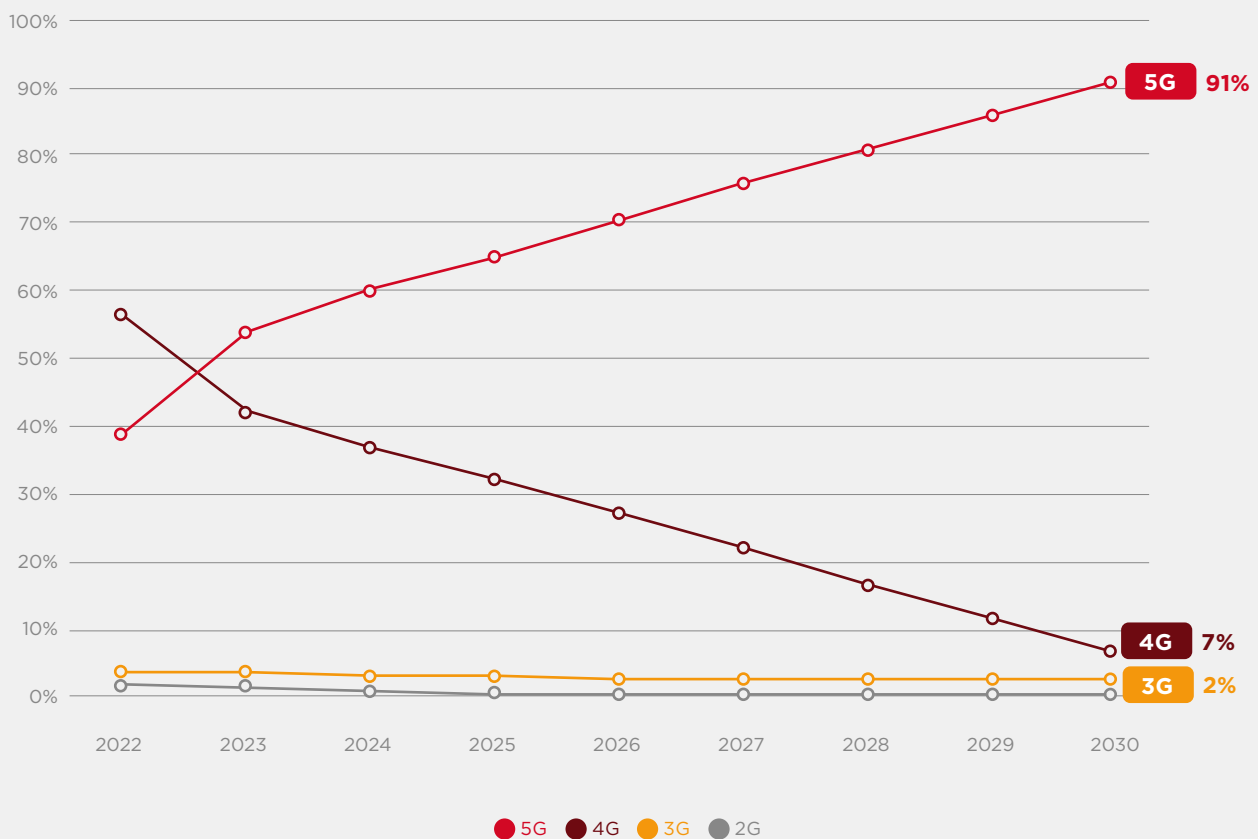
5G will overtake 4G in 2023 to become the dominant mobile technology in North America

5G adoption, as a percentage of total connections, continues to rise in North America, following new network deployments. Over the period to 2030, 5G connections will more than double to 447 million, equivalent to an adoption rate of 91%. The dominance of 5G in the region means that legacy networks (2G and 3G) are being phased out.

2G/3G sunsetting removes the availability of circuit-switched emergency calling (the technology typically used for emergency calling in markets where voice over LTE (VoLTE) has been deployed). Following concerns regarding the availability and interoperability of VoLTE emergency calls in both the US and Europe, the GSMA and its members have come together to update and align technical specifications.¹

Figure 3
North America: mobile adoption by technology

Percentage of total connections



Source: GSMA Intelligence

1. "How we're addressing VoLTE emergency call issues", GSMA, May 2023



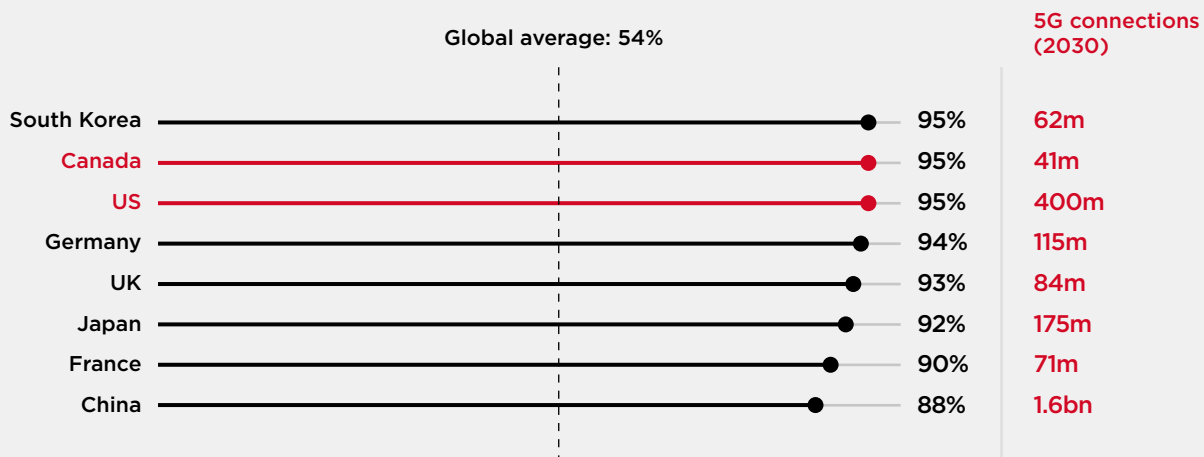
The US and Canada are among the global leaders in 5G adoption

As a pioneer market, North America has experienced significant 5G growth, with adoption rates of the technology expected to reach 59% in the US and 34% in Canada by the end of 2023. While the leading markets in the region have much higher 5G adoption rates than the global average, the adoption rate in the Caribbean remains much lower. 5G adoption in the Caribbean will gather speed across this decade, reaching 21% (5 million connections) by 2030.

Figure 4

5G adoption in 2030

Percentage of total connections



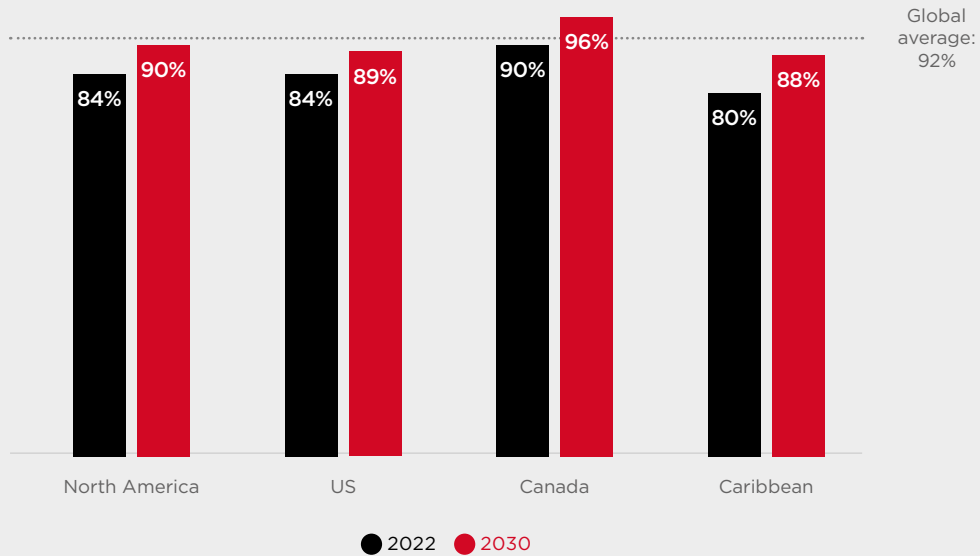
Source: GSMA Intelligence

There will be over 430 million smartphone connections in North America by 2030

By 2030, smartphone adoption will reach 89% in North America, compared to the global average of 92%. The increase in smartphone connections is consistent across the region, but there is still some headroom to grow. Availability of affordable smartphones have played a key role in driving smartphone adoption; in North America, a smartphone costs around 2% of monthly income, according to the ITU.²

Figure 5
North America: smartphone adoption

Percentage of connections (excluding licensed cellular IoT)



Smartphone connections in North America (2030)



US
377 million



Canada
42 million



Caribbean
21 million

Source: GSMA Intelligence

2. Connectivity and digital infrastructure (Affordability), ITU, 2022

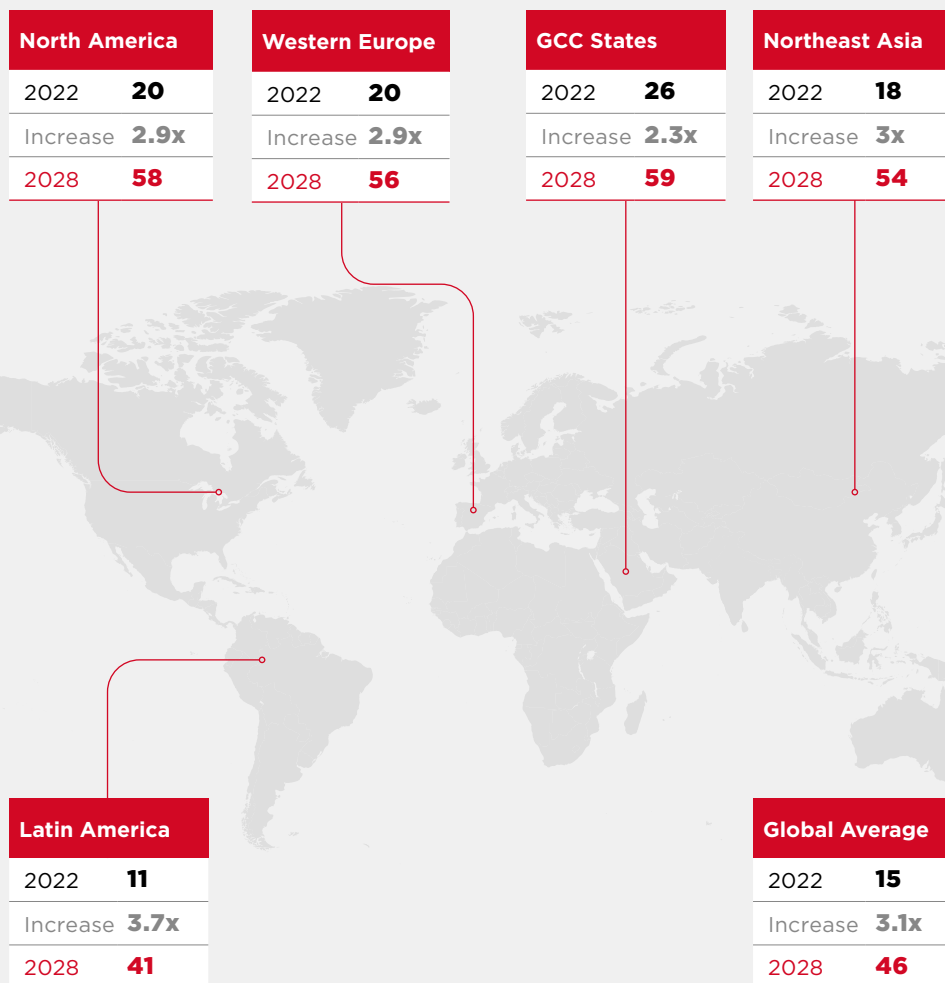
Mobile data traffic in North America will almost triple between 2022 and 2028

Mobile data traffic will rise considerably in North America as unlimited data plans and improved 5G network coverage and capacity increasingly attract new mobile and 5G FWA subscribers. According to a GSMA Intelligence survey, 5G users are more interested than 4G users in adding services and content to their mobile contracts.

The increase in data is primarily due to a rise in uptake of apps based on gaming, extended reality and video. To meet growing capacity and speed demands, operators must continuously evolve mobile networks within the RAN domain, utilising mid-bands and mmWave to ensure a similar experience across locations.

Figure 6
Mobile data traffic per smartphone

GB per month



Source: GSMA Intelligence, based on Ericsson Mobility Report June 2023

Licensed cellular IoT connections in North America will almost double by 2030

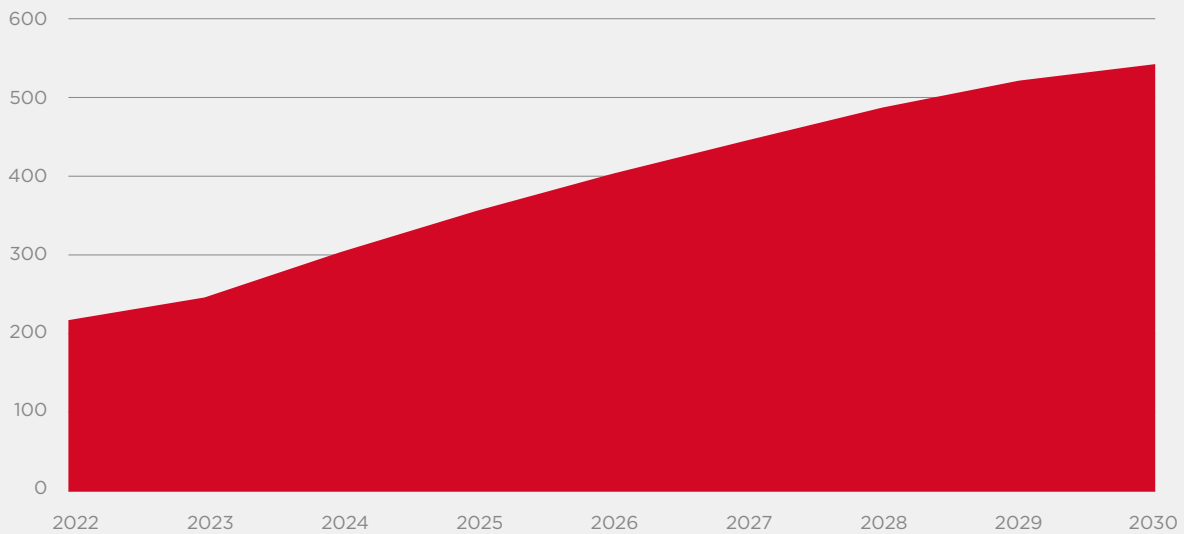
There will be more than 535 million cellular IoT connections in North America by 2030. The US is the leading contributor of IoT connections in the region, accounting for more than 90% of total connections. 5G enables new IoT use cases due to its low-latency and high-capacity capabilities, so there will be a boost to IoT applications as 5G networks expand across North America.

IoT devices have reached households and businesses across the region, helping streamline processes and increase efficiency. Around 34% of North American and European organisations currently use IoT technology within their business operations and another 12% plan to integrate IoT technology within the next year.³

Figure 7

North America: licensed cellular IoT connections

Million



Source: GSMA Intelligence

3. Statista



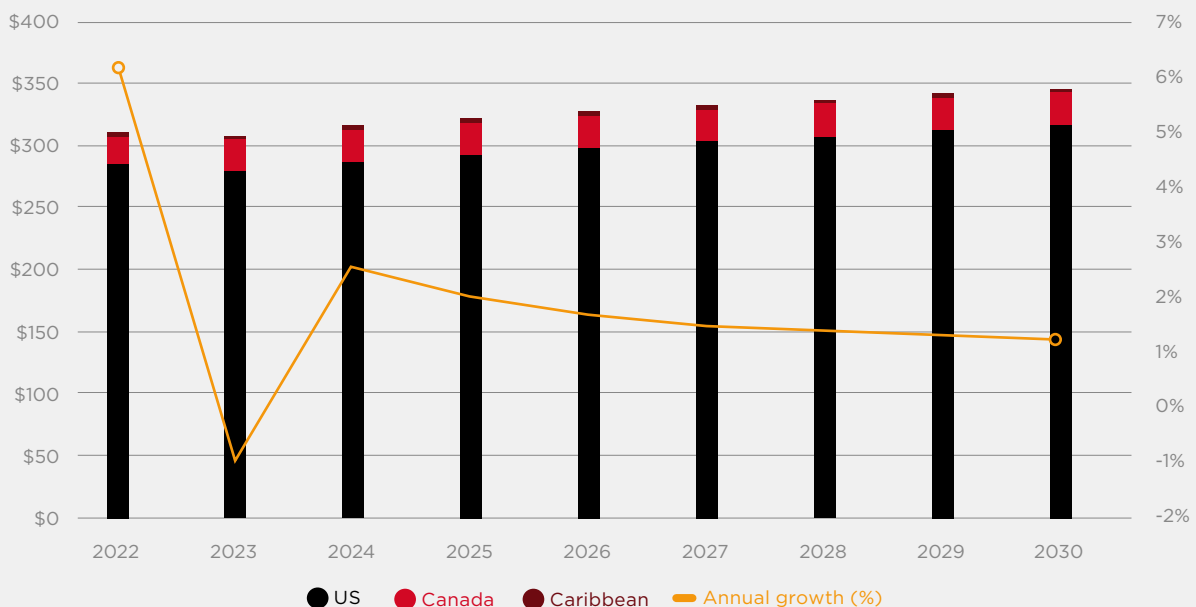
Moderate revenue growth in North America as 5G adoption rises

Revenue is expected to grow steadily in the region as operators continue to diversify their services and generate new revenue streams. Diversification of services has become a strategic imperative for operators amid the growth in 5G connections and investments in network deployments. It will be crucial for operators to meet the use case requirements of consumers and to serve enterprise customers with new solutions enabled by technologies such as 5G SA and edge computing.

Figure 8

North America: mobile operator revenue and year-on-year growth

Billion

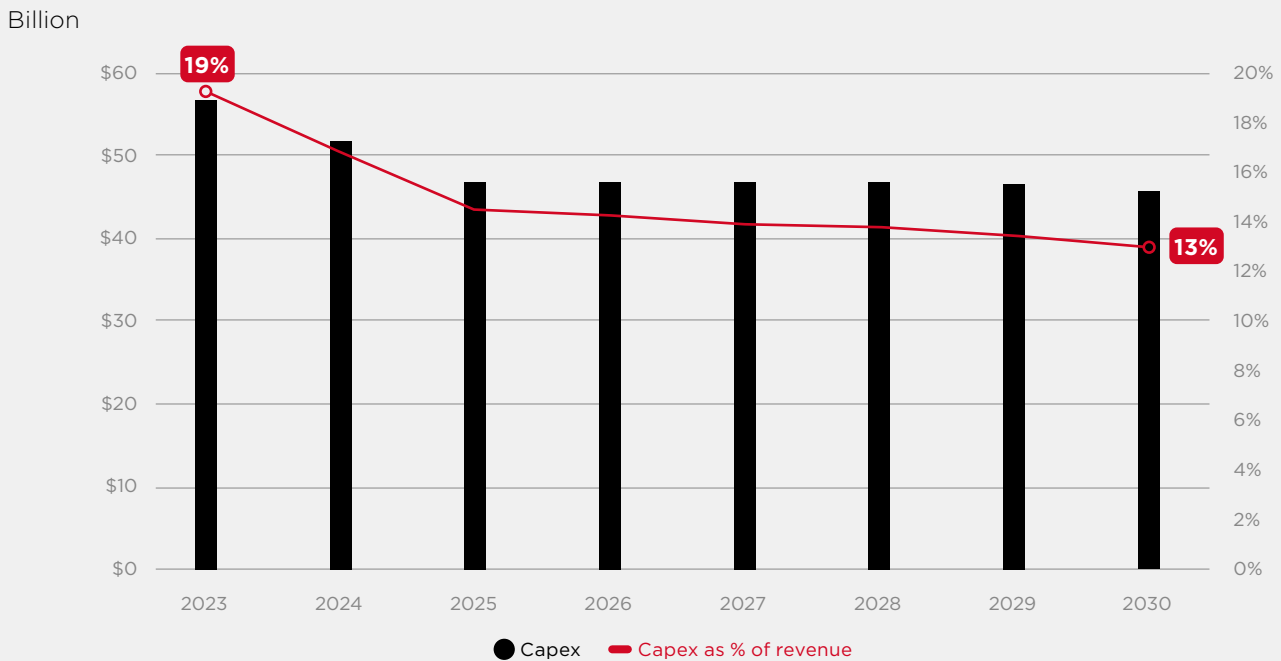


Operators will spend \$390 billion on their networks during 2023-2030, mostly on 5G

Following extensive 5G network buildout over the last few years, which has resulted in record capex intensity in North America, capex levels will begin to trend downwards as operators turn their attention to generating a return on investment.

The focus over the next few years will be on extending 5G coverage to less densely populated areas while also ramping up investment to support the growing momentum behind use cases enabled by 5G SA and 5G-Advanced.

Figure 9
North America: mobile operator capex



Source: GSMA Intelligence

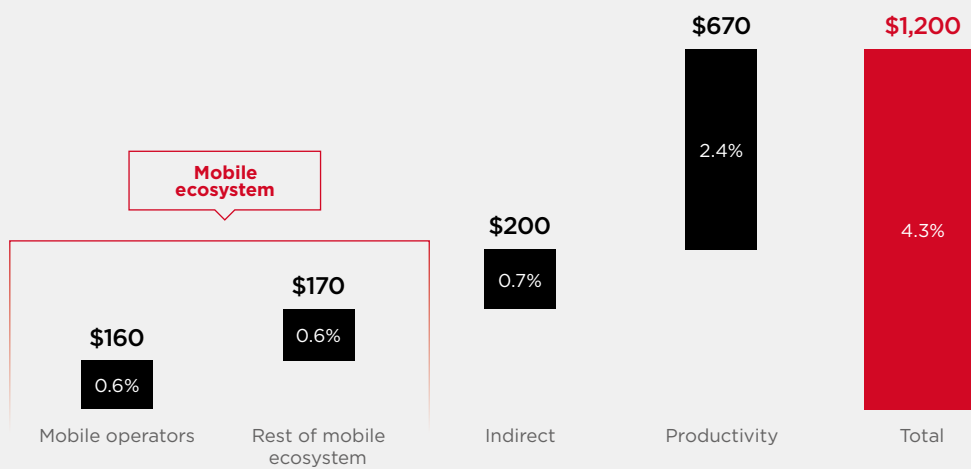
In 2022, the mobile sector added \$1.2 trillion of economic value to the North American economy

In 2022, mobile technologies and services generated 4.3% of GDP across North America, a contribution that amounted to \$1.2 trillion of economic value added. The greatest benefits came from productivity effects reaching \$670 billion, followed by indirect contributions, which generated \$200 billion.

Figure 10

North America: total economic contribution of the mobile ecosystem, 2022

Billion



Source: GSMA Intelligence

By 2030, mobile's economic contribution in North America will reach over \$1.3 trillion

By 2030, mobile's contribution will reach more than \$1.3 trillion in North America, driven mostly by the continued expansion of the mobile ecosystem and verticals increasingly benefiting from the improvements in productivity and efficiency brought about by the take-up of mobile services.

Figure 11
North America: economic impact of mobile

Billion



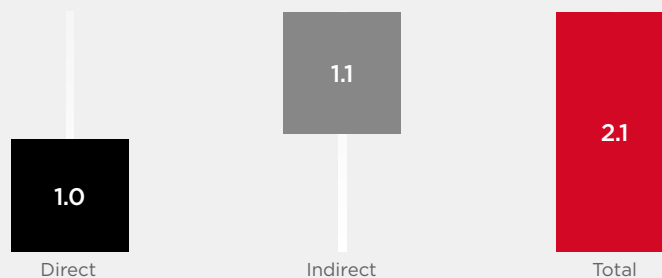
Source: GSMA Intelligence

The North American mobile ecosystem supported more than 2 million jobs in 2022

Mobile operators and the wider mobile ecosystem provided direct employment to around 1 million people across North America. In addition, the economic activity in the ecosystem generated around 1.1 million jobs in other sectors, meaning that around 2.1 million jobs were directly or indirectly supported.

Figure 12
North America: employment impact of the mobile industry, 2022

Jobs (million)



Source: GSMA Intelligence



In 2022, the fiscal contribution of the mobile ecosystem in North America reached \$130 billion

In 2022, the mobile sector made a substantial contribution to the funding of the public sector, with around \$130 billion raised through taxes on the sector. A major contribution came from services VAT, sales taxes and excise duties, which generated \$50 billion, the same amount as employment taxes and social security. This was followed by corporate taxes on profits, which generated \$20 billion.

Figure 13

North America: fiscal contribution of the mobile industry, 2022

Billion



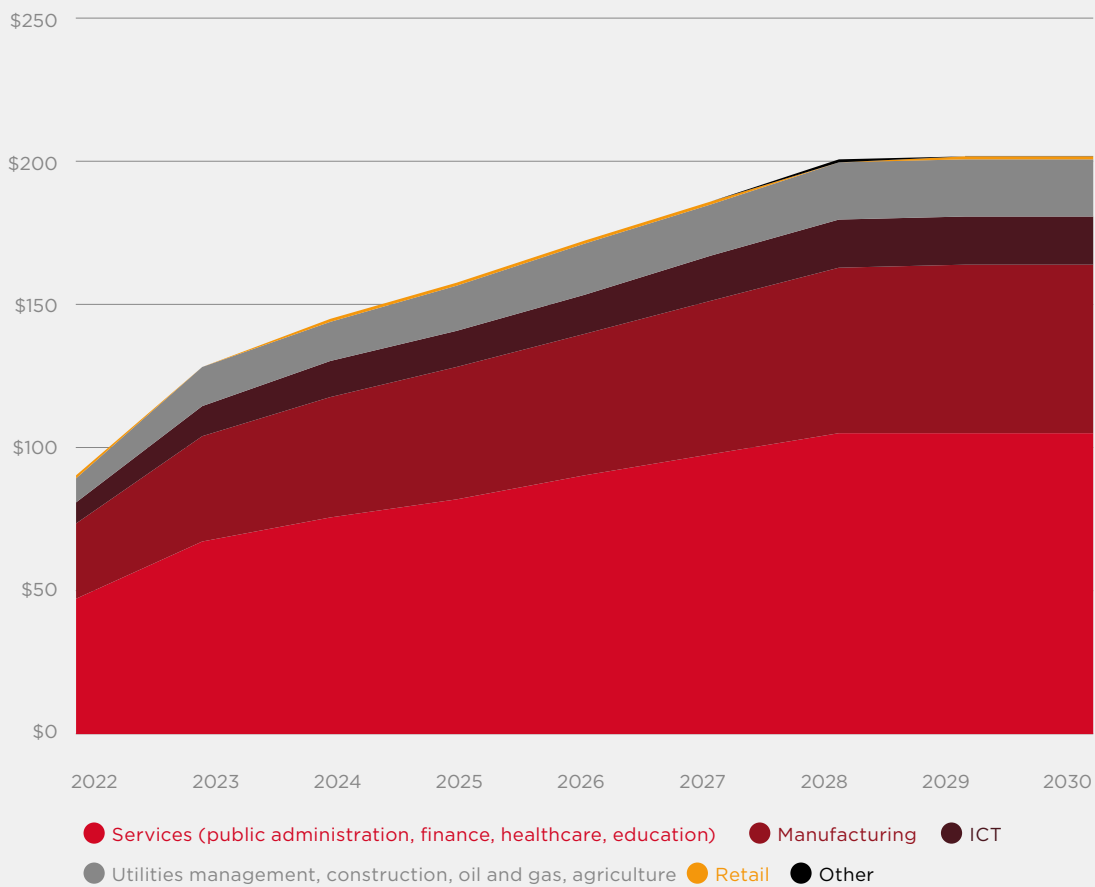
Source: GSMA Intelligence

5G will add more than \$200 billion to the North American economy in 2030

5G is expected to benefit the North American economy by \$203 billion in 2030, or around 16% of the overall economic impact of mobile. Much of the 5G benefit will materialise over the next five years. Towards the end of the decade, growth in 5G economic benefits will stabilise as the technology reaches widespread adoption

Figure 14
North America: annual 5G contribution by industry

Billion



Source: GSMA Intelligence

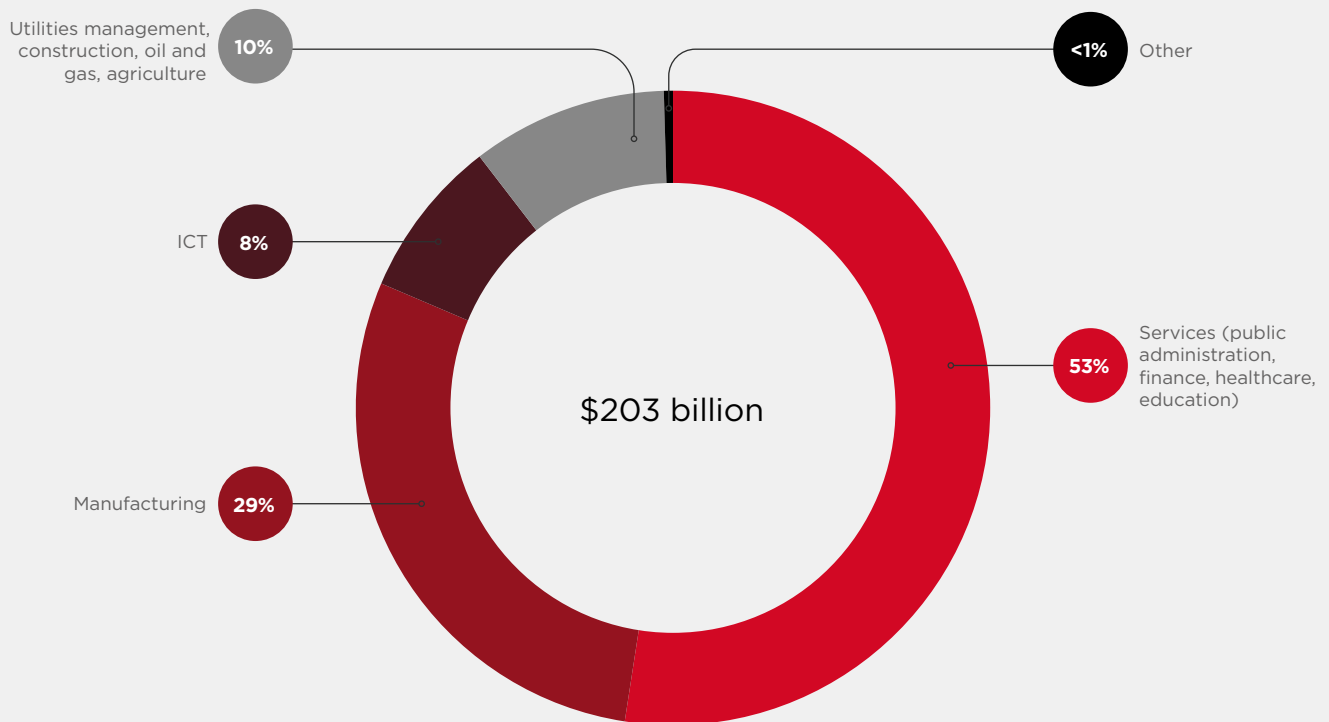
The benefits of 5G in North America in 2030 will focus on the services and manufacturing industries

5G is expected to benefit most sectors across the North American economy, depending on their ability to incorporate 5G use cases in their business. Over the period to 2030, 53% of benefits are expected to originate from the services sector, while 29% is expected to come from the manufacturing sector, driven by applications such as smart factories, smart cities and smart grids.

Figure 15

North America: 5G contribution by industry, 2030

Percentage of total benefit



Source: GSMA Intelligence



02

Mobile industry trends



2.1

The 5G monetisation imperative grows

As 5G adoption as a percentage of mobile connections in North America passes 50% in 2023, the monetisation imperative will escalate. It will be important for operators to assess what makes the new wave of 5G consumers different from early adopters and to gauge the impact of increased 5G adoption on data traffic and mobile revenues.

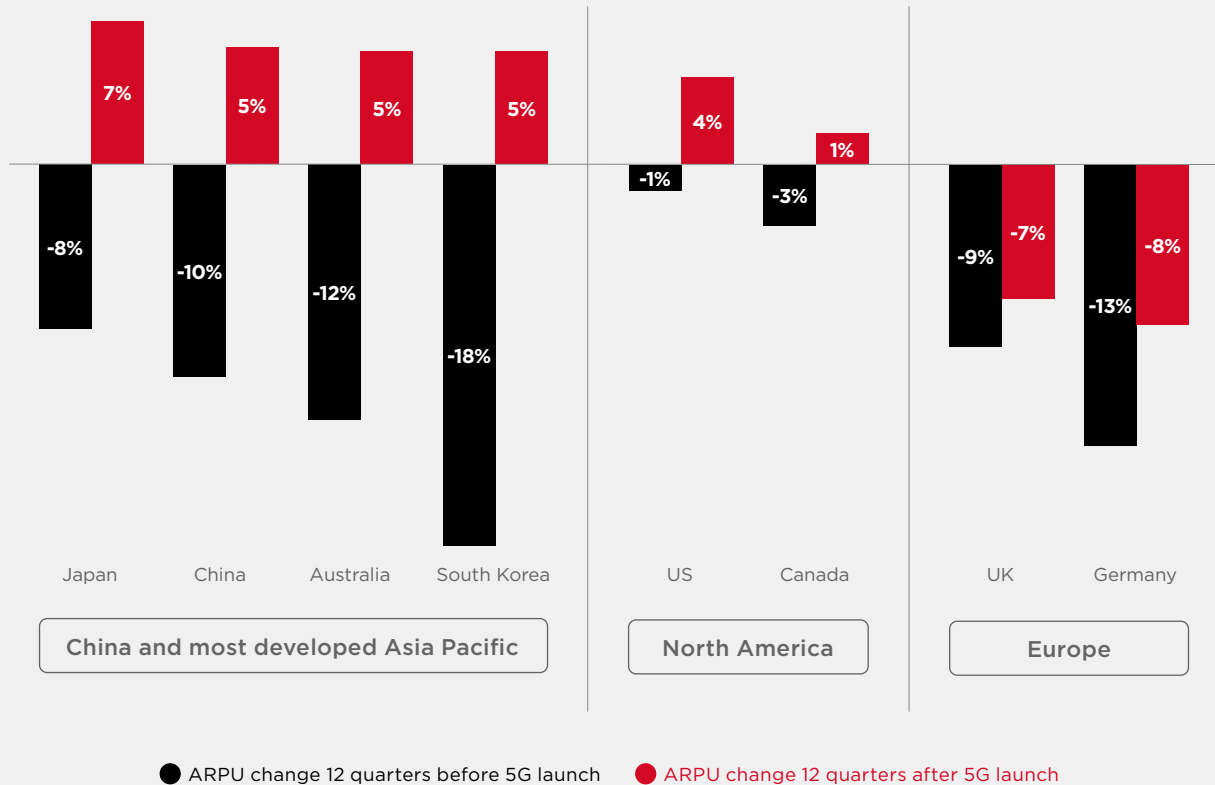
GSMA Intelligence research shows that the mobile ARPU trend in the US and Canada improved in the 12 months after launching 5G.⁴ As multiple drivers affect ARPU, separating the effect of 5G from that of other drivers (e.g. macroeconomic trends and regulation) is

difficult. Nevertheless, 5G seems to be one of the main factors behind ARPU growth, which matches what some of the pioneer 5G operators are communicating to investors and the wider ecosystem in their quarterly earnings.

5G is also having a positive impact on revenue growth for operators beyond mobile services. The US is the largest 5G FWA market globally, with just under 4 million 5G FWA connections.⁵ Moreover, T-Mobile and Verizon are the only operators in the world to have more than 1 million 5G FWA connections each.

Figure 16

Mobile ARPU trend by region



Source: GSMA Intelligence

4. [5G adoption and mobile ARPU: is there a connection?](#) GSMA Intelligence, 2023

5. [5G FWA on the rise: state of the market, new developments and outlook through to 2030](#), GSMA Intelligence, May 2023



5G SA will be essential to delivering the full benefits of 5G

North American operators continue to make progress on 5G SA deployments. T-Mobile was the first operator in the region to deploy a nationwide 5G SA network. It subsequently added 5G SA support for mid-band spectrum in November 2022. Additionally, Verizon began to move customer traffic from its 5G non-standalone core to its 5G SA core in late 2022, while AT&T completed a series of tests (including 5G SA carrier aggregation) in mid-2023 as it gears up to launch 5G SA.

5G SA brings a host of new capabilities that will be crucial to monetising 5G investments, including improved support for network slicing. US operators have touted public safety networks as an early slicing use case.⁶ Meanwhile, T-Mobile has launched a 5G network slicing beta for developers to enable new service creation at greater scale. There are also synergies between 5G SA and private wireless networks, with T-Mobile recently striking a deal to deploy a private 5G SA network at selected minor league baseball stadia to help managers and umpires review and challenge calls.

Private 5G brings new opportunities for mobile operators

Private wireless solutions are gaining traction as verticals accelerate their digital transformation plans. Over half of North American operators expect private wireless to account for over 10% of their total enterprise revenues by 2025, according to a GSMA Intelligence survey. The contribution of private wireless to operator enterprise revenues should rise in the second half of the decade as private 5G network equipment and devices become more readily available.

Manufacturing is the largest industry for private wireless networks; industrial premises in the form of factories and warehouses are a natural setting for private wireless solutions.

However, with the advent of 5G, deployments are gathering pace in several other sectors:

- **Healthcare:** Verizon has announced the deployment of a private 5G network servicing a veterans' hospital in California. The network enables advanced clinical capabilities such as augmented reality-assisted presurgical guidance.
- **Live entertainment:** Verizon has deployed a private 5G network at the Formula 1 Miami Grand Prix track. The solution provides connectivity for venue management use cases such as ticket scanning and digital sign management.
- **Military and defence:** The US Department of Defense is investing more than \$100 million in a private 5G network for the marines at their global logistics centre in Georgia.

6. "Verizon hints at network slices for public safety", Light Reading, April 2023

2.2

Generative AI takes centre stage

Mobile operators have utilised AI for a while now to varying degrees. However, the emergence of generative AI has pushed the envelope on AI capabilities and thrust AI technology into boardroom conversations globally.

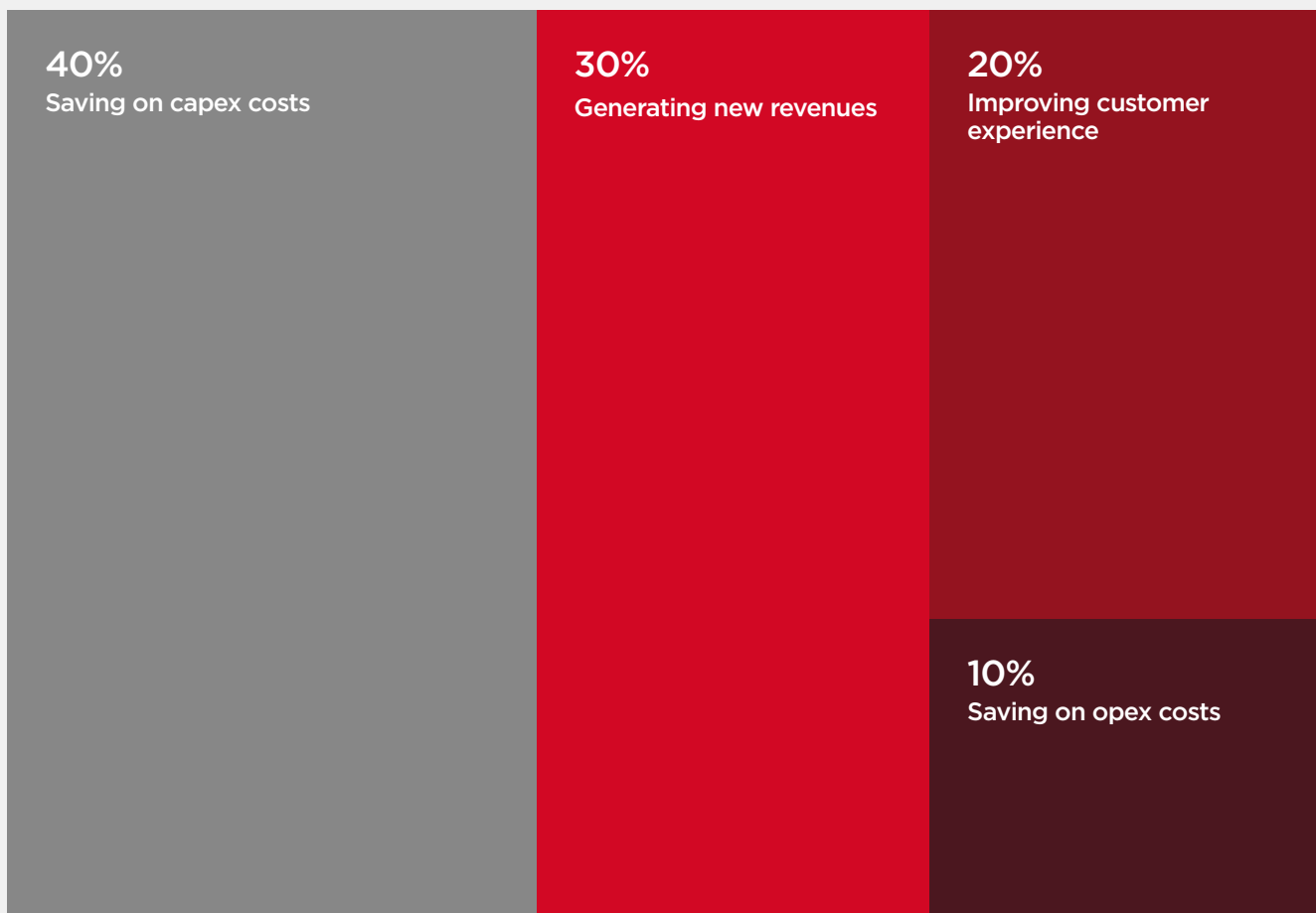
Advanced AI tools and models such as ChatGPT can help operators achieve efficiencies and cost savings in their customer services functions. While many operators already utilise conversational AI

tools in their customer services department, this has mostly been limited to basic functionalities such as responding to simple queries, call routing and smart handover to agents. With generative AI tools, operators can attempt to automate more complex functions that require a better understanding of context, improved ability to follow a conversation and advanced synthesis of information.

Figure 17

Generative AI can help operators achieve their network transformation objectives

What is the primary goal driving your network transformation strategy?
(Percentage of North American respondents)



Source: GSMA Intelligence Operators in Focus: Network Transformation Survey 2022

AT&T outlines generative AI plans

AT&T has detailed plans to deploy OpenAI's ChatGPT service among staff in a bid to improve efficiency and creativity.⁷ The US operator said in June 2023 that it plans to deploy Ask AT&T, with plans to use it for software coding and development, translating customer and staff documents from English to other languages, and simplifying its records.

AT&T noted that it worked through potential security concerns with OpenAI-backer Microsoft to make the set-up safe for its employees and corporate data. Moreover, the operator is assessing potential future developments for

Ask AT&T, including network optimisation, updating legacy software, further customer service uses, HR queries and cutting meeting times by automating the creation of summaries and action points.

Additionally, AT&T has partnered with Nvidia to use Nvidia-powered AI for processing data, optimising service-fleet routing and building digital avatars for employee support and training. Nvidia noted that AT&T is the first telecoms operator to explore the full suite of Nvidia AI offerings.⁸

A more personalised service across the board

Personalisation of customer offers and services has been an ongoing journey for operators, and the current slate of available and upcoming advanced AI models should enable the path (over time) towards hyper-personalisation. There is already evidence of this, with Verizon using AI models to provide customers with personalised recommendations as part of its MyPlan pricing options.⁹

Furthermore, operators offering services beyond connectivity directly to consumers (e.g. digital entertainment services) could deploy the latest AI models to achieve further personalisation of these services. For example, operators providing pay-TV and gaming services could offer better content recommendations and evolved voice search.

AI regulation will be a growing priority

Despite the potential to reap significant benefits from the application of advanced AI in business and society, there are valid ethical concerns around the technology that still need to be addressed. This was emphasised recently when several tech companies, including OpenAI, Amazon, Google and Microsoft, made voluntary commitments to the US government to implement measures designed to ensure the safe and transparent development of AI.¹⁰

As AI regulation increasingly moves up the policy agenda for authorities, collaboration will be critical to ensure that the necessary checks are in place for the responsible and sustainable development of the technology. The mobile industry is committed to the ethical use of AI in its operations and customer interactions to protect customers and employees, remove any entrenched inequality and ensure that AI operates reliably. This commitment is highlighted by recent mobile industry initiatives, such as the AI Ethics Playbook and the Mobile Privacy Principles.^{11,12}

7. "AT&T seeks staff benefits in generative AI", Mobile World Live, June 2023

8. "AT&T supercharges operations with NVIDIA AI", NVIDIA Newsroom, March 2023

9. "Verizon CFO talks AI and cable, but stays silent on BlueJeans", Light Reading, August 2023

10. "US companies agree voluntary AI measures", Mobile World Live, July 2023

11. [The AI Ethics Playbook](#), GSMA, 2022

12. <https://www.gsma.com/aiethics-saq/>



2.3

eSIM momentum builds

After a slow start during 2017–2019, eSIM smartphone launches have accelerated in recent years. The number of eSIM smartphone models commercially available for purchase reached 84 at the end of 2022, compared to 43 in 2020. Most smartphone manufacturers have launched eSIM phones, with Xiaomi and Nokia being new entrants in 2022. Samsung, Google and Apple have the widest portfolios of eSIM smartphone models. Importantly, many flagship smartphones are now eSIM-enabled (i.e. dual capability, with a removable SIM and eSIM)

and around 70% of eSIM smartphone models have 5G technology.

While Motorola was the first smartphone maker to launch an eSIM-only phone (the Razr 4G model in 2019), Apple's launch of eSIM-only iPhones in the US and Canada in September 2022 garnered more attention given Apple's larger scale. There has since been an acceleration in operator eSIM deployments and commercial launches.

Raising consumer awareness of eSIM is crucial to drive adoption

All major mobile operators in the US and Canada have made eSIM services available to their smartphone customers. This is also a global trend, as more than 85% of mobile operators in the top 30 markets by mobile revenue offer eSIM service for smartphones.¹³

Despite significant progress on commercial availability of eSIM devices and associated connectivity services, only 27% of US consumers were aware of eSIM in 2021 (up from 17% in 2020).¹⁴ As the main contact point with end users, operators and OEMs have a key role to play in accelerating consumer awareness and adoption.

Explaining the benefits of eSIM is crucial to drive adoption. GSMA Intelligence consumer survey data shows that 16% of consumers who are not interested in eSIM do not see its benefits, while another 12% do not understand how it works – this highlights the need for customer education. Also, as eSIM is a new technology that comes after 30 years of plastic SIMs, an education phase for consumer-facing employees (those working in retail outlets and call centres) is essential.

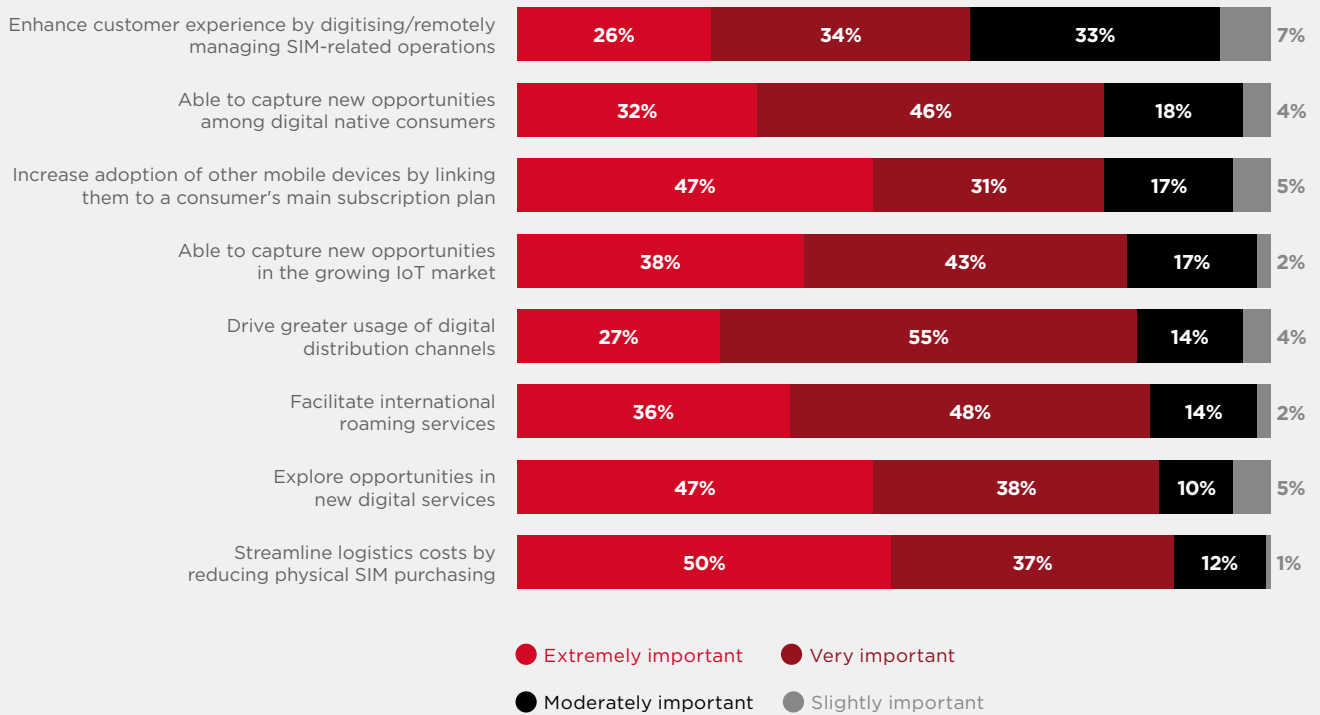
13. [eSIM in the smartphone market: calling at all stations](#), GSMA Intelligence, March 2023

14. [eSIM: market progress, consumer behaviour and adoption to 2030](#), GSMA Intelligence, July 2022

Figure 18

Potential benefits associated with eSIM: importance to business

Rate the following potential benefits associated with eSIM based on how important they are to your business (percentage of respondents)



Source: GSMA Intelligence Operators in Focus: Future of Retail Survey 2021 (N=100 operators)

eSIM adoption in IoT vertical use cases is growing

eSIM technology has long been seen as a substantial enabler and accelerator of IoT deployments across vertical sectors such as automotive (e.g. connected vehicles), utilities (e.g. smart meters and smart grids), logistics (e.g. tracking systems) and agriculture (e.g. farm monitors).¹⁵ North American operators are partnering with a range of players to accelerate eSIM adoption in the region. Recent examples include the following:

- **AT&T:** AT&T has been working with Kigen to streamline IoT device manufacturing and management as well as IoT SIM processes (for SIM, eSIM and iSIM). SIMs can be integrated in the early stages of the device manufacturing process, effectively streamlining both SIM and chip procurement while shortening the time to market for suppliers and end-user enterprises.

- **T-Mobile:** US startup Teal, the developer of an intelligent eSIM platform for IoT and private networks, has signed a wholesale agreement with T-Mobile. This partnership aims to simplify the process of connecting companies' IoT devices to T-Mobile's network. The move aligns with T-Mobile's vision for the future of IoT, providing companies that work with its partners (such as Teal) the same experience as if they had a T-Mobile SIM in their device.

- **Verizon:** Verizon Business has unveiled a platform for remote provisioning of IoT devices used in cross-border services, with Bell Canada and Telenor as its first international partners. Verizon stated that Verizon Global IoT Orchestration will work in North America, Europe and Asia Pacific, using an eSIM profile from one of its international carrier partners to connect to local networks. eSIM orchestration is handled centrally using the Verizon platform.

15. [Private 5G, eSIM, cloud and edge in vogue](#), GSMA Intelligence, June 2022

2.4

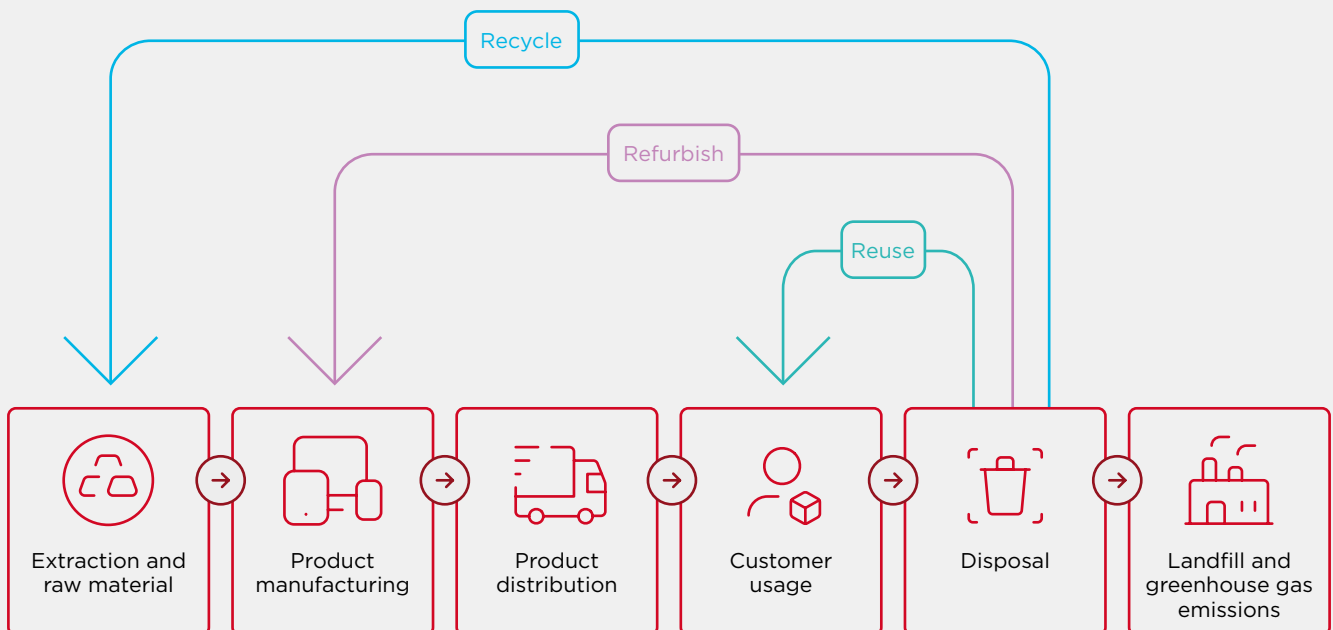
The shift towards circularity gains traction

The adoption of 5G is rising more quickly than that of any previous wireless technology. Demand for telecoms equipment and services is therefore greater than ever before. North America is a leading region in terms of 5G penetration, with penetration reaching 50% in Q2 2023, accounting for almost 220 million 5G connections in total. The region is uniquely placed as one of the largest consumer markets for new 5G devices. Given the growing demand for telecoms equipment, the concept of a circular economy has been developed as a transformative model to reuse products, parts, components and materials in successive production cycles to reduce waste and pollution.

There are nearly 400 million active feature phone and smartphone connections across North America, a figure that rose by more than 100 million in the past 10 years. Amid growing concerns around the generation of e-waste and unsustainable levels of consumption of natural resources, the concept of circularity has risen up the agenda for policymakers and industry players. This is becoming the norm in the production of mobile phones, with OEMs developing long-life devices and using recyclable and recycled materials as a means to reduce the number of devices and components that end up as waste. Here, the guiding principles of reuse, recycle and refurbish are used to extend the life of a product and, consequently, reduce or eliminate waste in the production and usage cycle.

Figure 19

The concept of the circular economy



Source: GSMA

The technical lifespan of a mobile device is now between four and seven years.¹⁶ However, this is not yet matched by the average use period of mobile devices, which is around three years.¹⁷ This suggests that the biggest barrier to reducing waste is consumer behaviour. As such, incentivising consumers will be crucial to success, although this could be complicated by a variety of factors that affect their choices, such as affordability, information availability, social norms and personal preferences.

Governments and industry players have a role to play in incentivising consumers. For instance, there is an opportunity to build new channels for suppliers to collect, refurbish and resell devices, as well as to educate consumers and implement awareness campaigns on sustainability. Operators and other ecosystem players across North America are already taking a lead in this regard, with initiatives to drive circularity in mobile phones and other digital devices.

Initiatives to drive circularity in the US

AT&T's efforts to reduce e-waste

AT&T is committed to managing its internal e-waste in a responsible manner. Device waste is refurbished, resold or responsibly recycled with R2-certified vendors, depending on the device's condition. AT&T follows the Restriction of Hazardous Substances Directive and the Waste from Electrical and Electronic Equipment

Directive for e-waste disposal. In 2022, AT&T managed the end of life of nearly 15 million devices, with more than 13 million devices being refurbished or resold and more than 1.6 million customer devices being recycled.

Verizon's recycling and waste diversion

In 2022, Verizon reused or recycled approximately 43.4 million pounds of e-waste, including 1.6 million pounds of plastic and 2.7 million pounds of lead-acid batteries. To support local communities in safely recycling e-waste, Verizon sponsors free recycling events that are open to its employees and the public.

Community members can bring e-waste items, such as a personal computer, television or toaster, for safe disposal. Verizon aims to collect and recycle 10 million pounds of e-waste from communities by 2026. Since 2009, Verizon has collected over 7 million pounds of e-waste.

Recycling is just the beginning for T-Mobile

Since T-Mobile launched its recycling programme back in 2008, over 14.4 million T-Mobile customer devices have been reused or resold. The company also uses eco-friendly packaging and works with the Cellular Telecommunications and Internet Association's Green Working Group to help minimise the impact and footprint of phone packaging.

Examples of how T-Mobile makes packaging for its postpaid phones eco-friendly include:

- labelling all packaging with internationally recognised symbols to encourage recycling
- eliminating plastic inserts or trays within product containers
- reducing the use of volatile organic compounds, both on and within packaging.

16. Miliute-Plepiene, J. and Youhanan, L. (2019), E-waste and raw materials: from environmental issues to business models, IVL Swedish Environmental Research Institute
17. Statista

2.5

Growing opportunities for operators as fintech demand surges

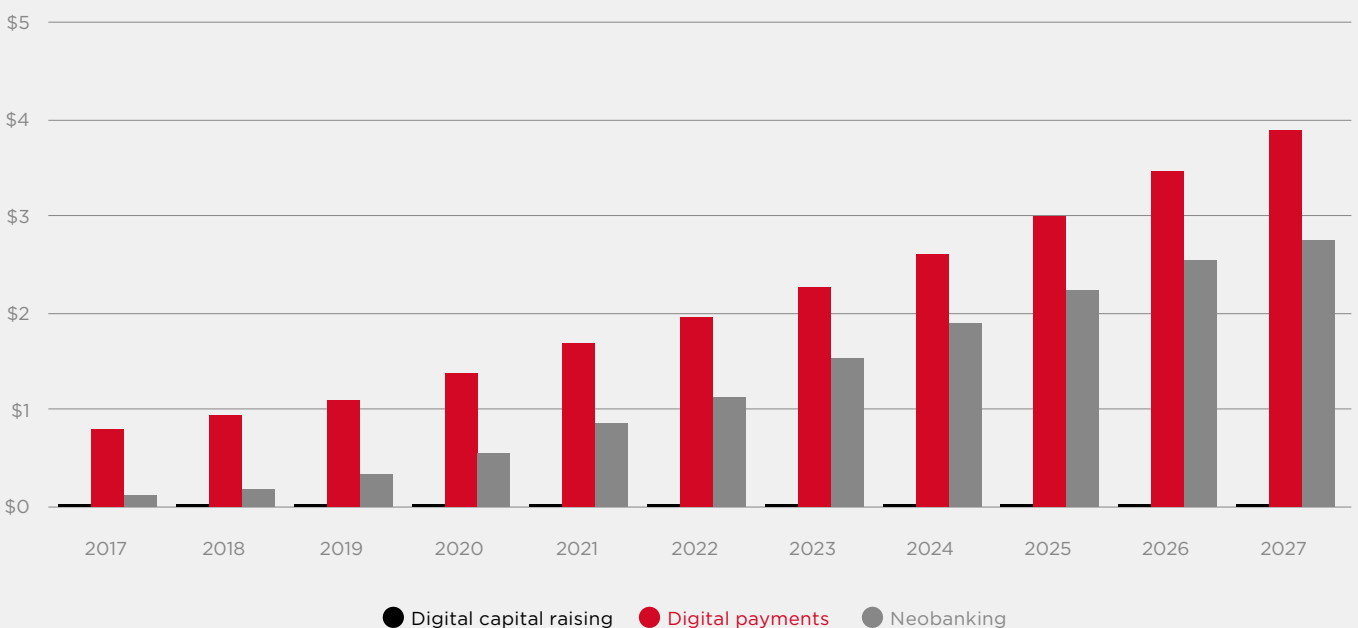
In North America, the number of people using digital payments is expected to rise to almost 439 million, bringing the total fintech transaction value in the region to \$3.91 trillion by 2027.¹⁸ As such, North America is a critical fintech market and innovation hub, which is projected to grow fourfold to \$520 billion in revenues in 2030, with the US accounting for 32% of global fintech revenue growth.¹⁹

Along with digital payments, neobanking will lead to higher transaction values over other fintech segments.²⁰ Digital investment, digital capital raising and digital assets are some of the most significant emerging segments in the sector.

Figure 20

Fintech transaction value by segment in North America

Trillion



Source: Statista

Within North America, the US will continue to dominate the fintech sector. Meanwhile the Canadian ecosystem is set for expansion. With more than 1,200 fintech companies in Canada, investments in the sector have soared in the country. In the

Caribbean, the digital payments market is set to swell to 21 million users by 2027, followed by growth in segments such as digital capital raising, which includes crowdfunding and crowdlending, among others.

18. FinTech - North America, Statista Market Insights, April 2023

19. Reimagining the Future of Finance Report, BCG + QED Investors, May 2023

20. Neobanking: A neobank is a type of challenger bank that operates solely digitally. Neobanks are newly established banks without any physical branches and can provide their services both via mobile or desktop devices. Neobanks can be one of two types: those that have a banking licence and those that do not.

Digital payments: The digital payments market segment is led by consumer transactions and includes payments for products and services made over the internet as well as mobile payments at point of sale via smartphone applications and cross-border money transfers made over the internet (digital remittances).

Emerging technologies driving innovation

Driven by the increasing use of digital wallets, the fintech sector is also utilising emerging technologies, including AI and blockchain, such as in the following examples:

- US-based fintech startup Plentina offers a digital-first experience for financial services leveraging AI. The startup has been partnering with telecoms companies globally to help users access a BNPL service that allows them to take out a microloan in the Philippines conveniently.
- In the US, PayPal launched a US dollar-backed stablecoin on the blockchain in August 2023. The stablecoin is a considerable step forward considering its usage for relatively safer transactions with Web 3.0. The large customer base of PayPal creates an opportunity to attract a substantial number of first-time crypto users.
- Upstart, a US-based lending platform, offers AI-powered credit risk rating algorithms with positive implications for consumers and bank partners.

Technological upgrades such as 5G, AI and blockchain could spur more efficient digital services. The technologies will enhance service performance while enabling new and better features. There is a growing focus on AI and generative AI use cases in financial planning and wealth management, along with a growing diversity of geographic locations within the region attracting fintech funding.

As newer financial solutions are built, a growing number of operators are eyeing partnerships to capitalise on financial services shifting to digital channels. Operators are targeting services for customers to engage with digital capabilities for businesses, including fraud prevention, credit risk, identity and digital currencies.

Financial services are increasingly moving to mobile devices

Financial services are increasingly shifting to mobile phones as the share of 4G/5G users using their devices daily for financial services continues to increase. In Canada, the use of mobile phones for all e-commerce activities will rise to 42% in 2026 (compared to 37% in 2022).²¹ In the US, the share of 4G/5G users using their devices daily for mobile banking, online shopping, paying bills and contactless payments grew by four percentage points, on average, between 2020 and 2022.²² This rise in usage reflects the growing momentum behind digital financial services.

As another example of this momentum, Apple recently announced the launch of a BNPL service. It also launched a high-yield savings account through a partnership with Goldman Sachs, which reportedly brought in \$990 million in deposits over its first four days. By the end of the first week, around 240,000 accounts had reportedly been opened. Beyond digital payments and assets, there is growing interest in the insurtech segment with relatively robust funding, as evidenced by the \$2.6 billion deal between Duck Creek Technologies, a technology solution provider to insurance companies, and Vista Equity Partners.

21. The Global Payments Report 2023, Worldpay, May 2023,

22. [Banking on an opportunity, as consumers embrace mobile for financial services](#), GSMA, 2023



03

Mobile industry impact



3.1

Extending connectivity to underserved areas

North American mobile operators continue to innovate when it comes to addressing the digital divide. Their investments to improve network infrastructure in rural areas have played a major role here, as evidenced by recent developments in the fixed broadband market, where FWA is growing in importance.

Despite fixed broadband coverage being prevalent in high-income countries, coverage for the final 10% of rural households remains stubbornly low. This is an issue of economics. Passing fibre, for example, in urban or suburban areas costs roughly \$600–900 per premises, but this can be 5–10× higher for the final 10% of households, deterring most companies from doing so.

Governments in North America have introduced funding to incentivise fibre rollouts.²³ 5G FWA can

also play an important role in improving broadband speeds in the region. In the US, T-Mobile and Verizon have targeted households without fibre broadband and have together accumulated over 5 million FWA subscribers. Meanwhile, AT&T launched a 5G FWA service in August 2023 called AT&T Internet Air, which explicitly targets DSL customers in locations that are due to have their legacy copper networks deactivated.

Momentum is also growing in other parts of North America. In Greenland, T-Mobile and Ericsson announced an extensive collaboration for the joint vision of a wireless Greenland. Starting as a pilot in 2022, the two companies will deploy a 5G FWA service in Sisimiut, Maniitsoq and Narsaq, before it is realised in several places in the rest of the country.

Satellite momentum builds

Aerial technologies, such as satellites, could also help improve rural connectivity. This is highlighted by the growing momentum behind telco-satellite partnerships, such as the below:

- **T-Mobile** and SpaceX have launched an initiative to connect mobile devices to Starlink satellites, eliminating ‘dead coverage’ zones across the US.
- AST SpaceMobile is testing transmissions from smartphones directly to its new satellites, leveraging spectrum licences owned by **AT&T**. In April 2023, the first voice call was made from Texas to **Rakuten** in Japan with Samsung Galaxy S22 smartphones connected to AST SpaceMobile’s BlueWalker 3 test satellite.
- Satellite service provider Lynk Global has agreed a deal with **Rogers** to deliver connectivity to standard mobile devices beginning in 2024. Rogers stated the link-up will make it the first operator in Canada to provide coast-to-coast satellite coverage when combined with another connectivity deal it announced separately with SpaceX covering SpaceX’s Starlink constellation.

The renewed momentum for satellite has arisen because of the 5G new radio standard from the 3GPP that incorporates integration for non-terrestrial networks. This means that, where commercial partnerships are in place, standard smartphones and IoT devices will be able to connect seamlessly with traditional cellular base stations and satellite systems (effectively ‘satellite base stations’).

5G FWA can play an important role in improving broadband speeds in North America

23. For example, see the Broadband Equity Access and Deployment (BEAD) program in the US.

3.2

Mobile's impact on the SDGs

In 2022, the North American mobile industry accelerated its impact on the Sustainable Development Goals (SDGs). SDG 7: Affordable and Clean Energy, SDG 1: No Poverty and SDG 3: Good

Health and Well-being scored highest in the region, with SDG 7 and SDG 1 also among the three most improved SDGs since 2015.²⁴

Figure 21

Mobile's impact on the SDGs in North America



Source: GSMA Intelligence

Operators make significant strides in climate action

The latest GSMA Mobile Net Zero report shows that many North American operators are committing to the mobile industry's ambition to become net zero by 2050.²⁵ Moreover, T-Mobile has become the first mobile operator in the US to set a net-zero goal for all three emissions scopes validated by the Science Based Targets Initiative (SBTi), using the SBTi's net-zero standard. This goal covers emission Scopes 1 and 2, inclusive of direct emissions from T-Mobile's operations and facilities and indirect emissions from purchased electricity. It also covers the remaining indirect Scope 3 emissions, including those produced by suppliers, customer device usage, materials and fuel required to ship products and for employee travel.

The GSMA Mobile Net Zero report shows that progress is being made towards these targets. For example, North American operators saw a 5% reduction in both Scope 1 and 2 emissions between 2021 and 2022. Scope 1 and 2 emissions per connection declined even further by 9%.²⁵⁶

One of the key challenges to overcome in decarbonising the mobile sector is access to renewable electricity. The good news is that the industry is moving forward, with operators now directly purchasing 24% of their electricity from renewable sources, up from 18% in 2021 and 14% in 2020. For example, Verizon signed four renewable energy purchase agreements with a total renewable energy capacity of 410 MW, bringing the operator's total projected renewable energy capacity to more than 3 GW. The agreement will help support Verizon's goal of sourcing or generating 50% of its total annual electricity consumption with renewable energy by 2025.

However, operator demand is currently outstripping supply. Governments can help expand renewable electricity access to facilitate private-sector purchases, which will help the mobile industry maximise its impact on SDG 7 by 2030. Innovative solutions such as hybrid energy management as demonstrated by Ericsson can also help operators meet their decarbonisation targets.²⁷

24. See sdgreport2023.gsma.com

25. [Mobile Net Zero: State of the Industry on Climate Action 2023](#), GSMA, 2023

26. *ibid.*

27. "Ericsson's energy-smart 5G site in Texas sets a new standard for sustainable network solutions", Ericsson, July 2023

IoT solutions support the industry's contribution to SDG 6 and 7

Mobile operators play a pivotal role within the IoT ecosystem, contributing significantly to a variety of applications, including smart city solutions. Building automation and monitoring are among the most common smart city IoT applications in North America. Recent advancements have been key to enabling these applications.

For instance, the integration of smart meters and cutting-edge machine-learning capabilities has greatly streamlined the management of both building and city infrastructure. This empowers utility companies and residents alike to closely track water and energy consumption as well as air quality. By fostering such proactive monitoring, the aim is to cultivate a healthier urban environment while also curbing wastage effectively.

Public-private partnership between the city of Sacramento and Verizon

A formal public-private partnership between the city of Sacramento and Verizon was formed in 2017.²⁸ The long-term partnership has the following objectives:

- Providing high-speed broadband access (fixed, mobile and Wi-Fi) for all citizens and areas of the city.
- Promoting the use of emerging technology-based solutions for the city's economy.
- Developing intelligent transport-system solutions that optimise traffic and reduce CO₂ emissions.
- Introducing digital-based tools for citizen engagement and data privacy protection.
- Optimising and securing the use of city infrastructure.

As part of this partnership, Verizon goes beyond simply offering connectivity, being involved in a number of solutions and offering city solutions via an as-a-service model. The partnership gives the operator an opportunity to test emerging technologies such as 5G for various applications (e.g. video analytics for public safety and the use of immersive reality, mainly AR, for public safety activities such as fire intervention).

This also allows the operator to be more visible to citizens, enabling them to see the operator as a city stakeholder involved in developing a digital culture in the city.²⁹

28. "Verizon announces partnership with the City of Sacramento for a smarter, safer, more connected city", Verizon, June 2017

29. For more information, see [The changing shape of smart cities: new trends and new roles for operators](#), GSMA Intelligence, June 2022

04

Mobile industry enablers



Spectrum availability as a key driver of affordable 5G for all

North America continues to be a leader in 5G development. Strengthened by the use of the 3.5 GHz band and bolstered by further spectrum assignments, 5G connectivity is already proving to be a powerful driver of innovation and GDP growth. In 2030, 5G's contribution to GDP is expected to surpass \$200 billion. The success of 5G rollouts

depends on operators' 5G spectrum holdings across low, mid- and high bands to deliver both speed and geographical coverage. Additional spectrum can boost the provision of cost-efficient investment and enhance network quality in North America, which can help 5G become a central pillar of the region's economic development strategies.

Low bands

Low-band spectrum is a driver of widespread and affordable connectivity and is therefore a key building block for digital equality. Increased sub-1 GHz spectrum is essential to building coverage in thinly populated areas and providing indoor coverage in built-up and hard-to-reach urban areas. In addition, it would decrease the number of macro sites required, leading to lower energy consumption.

Rural connectivity continues to be a challenge in North America, particularly across difficult-to-connect rural regions. In the US and Canada, the 600 MHz band is already used for mobile (band n71)

with 2x35 MHz and this spectrum is being developed to enhance rural broadband. Adding 600 MHz to existing low bands is shown to raise download speeds by 30–50% in rural areas.³⁰

The amount of spectrum in band n71 was the result of an auction that matched the willingness of broadcasters to relinquish spectrum at prices mobile operators were prepared to pay. According to FCC documents for the 600 MHz auction, an auction outcome with 2x50 MHz would have been possible, extending the band further downwards.

Mid-bands

Mid-band 5G spectrum can play a central role in sustainable social and industrial development. According to a recent study by the GSMA, mobile networks will need on average 2 GHz of mid-band spectrum per country by 2030.³¹

In North America, that goal leaves a shortfall of 0.93 GHz beyond today's assignments. While the region is starting to move closer to the 2 GHz figure, maximising existing harmonised bands is crucial, and the lack of availability of the 6 GHz band for licensed 5G in part of the region makes meeting mid-band capacity needs a challenge.

One way forward is to maximise the amount of spectrum available in the 3.5 GHz range. The lower part of the range (3.3–3.45 GHz) is not available in the US, although it has been developed and deployed for 5G in many parts of the world. The lower part of the band (3.3–3.4 GHz) is currently used by military radar systems in some countries. However, coexistence between 5G and military radars is already successfully coordinated in several regions via frequency or geographical separation. Adopting such strategies can deliver additional harmonised capacity for growth.

30. [Vision 2030: Low-Band Spectrum for 5G](#), GSMA, 2022

31. [5G Mid-Band Spectrum Needs - Vision 2030](#), GSMA, 2022

High bands

mmWave frequencies help realise the full potential of 5G by enabling very fast download speeds, huge capacity and the lowest latencies. North America has been a pioneer on mmWave spectrum assignments and this leadership has paid off, expanding to other bands and unlocking additional possibilities. mmWave spectrum is essential for peak performance.

According to a recent report by the GSMA, 5 GHz of mmWave spectrum is required per market for enhanced mobile broadband. FWA and enterprise applications.³¹ Successful and effective mmWave spectrum assignments are therefore important to ensure 5G achieves its true potential in terms of performance and socioeconomic impact. Any spectrum capacity constraints should be addressed early by licensing adequate mmWave spectrum for IMT services.

WRC-23 offers a pathway to the future of connectivity

WRC-23, held under the auspices of the ITU, is an opportunity to increase digital equality, widen harmonisation and provide a clear roadmap to address future spectrum capacity needs.

Access to more low-band spectrum (470–694 MHz) is on the WRC agenda for countries in Europe, the Middle East and Africa, which can widen harmonisation of existing low bands in North America. The future of mid-band spectrum is also on the agenda. There is an opportunity to

expand the harmonisation of 3.3–3.8 GHz, while 4.80–4.99 GHz is also being considered as a way of providing additional mid-band capacity. Furthermore, many parts of the world will use 6 GHz for 5G following on from WRC-23.

These developments drive further harmonisation and scale, which in turn help to advance affordable and sustainable 5G services to more people and to lower the usage gap.

North America has been a pioneer on mmWave spectrum assignments

32. [Vision 2030: mmWave Spectrum Needs](#), GSMA, 2022



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